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FROM

Miss E. W. Withey

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A Handbook of
Systematic Instruction
in Drawing

By Frank Aborn

Cleveland, Ohio
The Cleveland Printing and Publishing Co.
1903

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Miss E. W. Withey
Cambridge

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Preface

IT is by fine examples and the intelligent execution of drawings of them that the taste for art is most surely cultivated. As the understanding broadens, exercise in design and emotional expression becomes practicable and effective. When drawings are made by a hit-or-miss process they can only be caricatures tending to demoralize taste rather than to cultivate it, and exercise in design is impracticable and ineffective.

The plan for instruction in drawing outlined in these pages aims to indicate methods of successfully bringing about those changes in the understanding of what is required, and in the ordinary methods of procedure which make for skill, and also to make the teaching of drawing a prime factor in true art education, by fostering that prime factor of art, appreciation of excellence.

This system is not experimental. It contains nothing untried or unproved, nothing unpractical, ineffective, unessential. It is believed to be the first real system of instruction in drawing. It has all the essentials of a system, viz.: A definite beginning and progress by orderly stages to a definite ending; provides specific means for establishing intelligence preparatory to execution; prescribes a definite and practical method of effectually utilizing observation and illustration, two potent coördinate agencies in understanding and execution; grades the conditions or forms of subject-matter presentation according to the obviousness of the means and requirements of execution incidental to each condition; and eliminates the element of chance by specific and adequate operations.

September, 1903.

Introduction

SYSTEMATIC instruction in drawing is a simple matter. Its salient features and the practicable expedients essential to carrying it on may be comprehensively explained in a very limited space.

A drawing can never be anything but an arrangement of lines.

The arrangement of lines constituting a drawing can never be anything but a copy of another arrangement of lines which constitutes its subject.

The arrangement of lines which constitutes the *real* subject of a drawing can never be anything but an image in the mind.

The image which constitutes the real subject of a drawing can never be wholly original, but is derived more or less from something else, which it is sometimes like and sometimes unlike. It may be derived from another drawing or print, in which case the image which is the real subject of the drawing will be a facsimile of that from which it is derived; it may be derived from an object, in which case it may be no more like that from which it is derived than a straight line is like a circle; or it may be a pure invention, in which case it will be derived from many different things and be a facsimile of no one of them.

But whatever the image which is the real subject of a drawing may be derived from, or whether it is in any respect like that from which it is derived, makes no difference; the real subject of a drawing can, under any possible circumstance, be nothing but an image in the mind, for it is impracticable and impossible to draw anything in the degree that its image in the mind is either wanting or indistinct.

Because it is impracticable to draw more than one line at a time it is necessary in drawing to individualize, or to select individual lines, determine their places and execute them in their places, one at a time. This necessitates deliberation and precision.

These are the fundamental facts upon which everything pertaining to drawing must be based. The complete apprehension of these facts constitutes complete intelligence in drawing. And the ability to execute in accordance with these facts, or to image arrangements of lines and be able to copy the imaged arrangements of lines, constitutes skill in drawing.

The making of a drawing is a process which is at once analytic and synthetic. It is analytic in that it consists, in one part, in selecting specific lines and separately determining their places in the given arrangement of lines constituting the subject. It is synthetic in that it consists, in another part, in arranging lines in their respective places in a drawing.

The teaching of drawing consists in so engineering thought and effort that this ability to image and analyze, and to organize reproduction of arrangements of lines, will develop itself.

The obstacle to this self-development of ability is habitual, disorderly practice; or the habit of planning while executing; or proceeding to execution before definitely determining what is to be done and how it is to be done; or sliding over intermediate steps with the expectation of subsequent correction. The removal of this obstacle consists in the reform of the habit of procedure: the substitution of orderly practice for disorderly practice.

This reform of habitual practice in drawing constitutes the only real difficulty in the way of absolutely successful instruction. It is easily accomplished by simply grading the subject-matter according to the self-evidentness of the requirements, and the adoption of two different and distinctly separate forms of exercise.

The self-evidentness of requirements depends upon the character of that from which the subject is derived, or is incidental to the form or condition of the subject-matter presentation, and has practically nothing to do with either the structural simplicity or complexity of the subject-matter itself. This will be seen on further inspection.

Of the two forms of exercise, one makes for intelligence by affording opportunities for the observation and illustration of the application of the process of drawing under conditions which render both the process and its application comprehensible. The other form of exercise makes for skill by affording opportunities to apply the process of drawing, in independent executions, under conditions the requirements of which are thoroughly understood but the means of meeting which are not so readily at command.

Exercises in illustration and observation are necessarily class exercises and require large wall-drawings especially adapted for the purpose, which are practically provided only in the form of charts or unerasable examples on portable blackboards. Blackboard drawings by the teacher, except occasionally, are impracticable for two reasons: First, because of the accuracy frequently required in their execution, adequate facilities for which are not usually available; and second, because as a rule the time at the teacher's command for their execution is insufficient.

Exercises in independent execution, except in object drawing, are necessarily "free for all" in which it is optional with the teacher to assign the examples or to allow each pupil to select a study for himself out of a varied assortment of good examples in the same condition; and the drawings are made without help from the teacher other than that given in the form of suggestions to individual pupils and looking to the betterment of methods of procedure, which are the causes of error, and not looking to the correction of immediate errors, which are results of unbusinesslike methods.

The variety of conditions under which subject-matter may be presented for drawing is infinite, including every possible shade of self-evidentness of requirement, but so closely are many conditions related that the ability to image and copy arrangements of lines under any one of them carries with it the ability to do the same under any of the group of allied conditions. So it is seen that the number of conditions necessary to constitute a thoroughly efficient and practicable system of instruction is in reality small; by actual experience it has been found to be no more than ten, each of which is fully explained in what follows.

THE fullest measure of success in teaching drawing can only be secured through a clear comprehension of, and strict adherence to, these fundamental essentials and the provision of these facilities:

An understanding of the requirements of drawing under each condition before proceeding to independent execution under that condition.

Continued independent execution under each condition until understanding has become skill in drawing under that condition.

The mastery of drawing under each condition in order.

Charts for class exercises.

Examples for independent execution in sufficient numbers and variety under each condition to insure sustained and spontaneous interest.

Transparent tracings for testing the accuracy of independent executions.

Background screens.

Models for object drawing, such as geometrical solids, vase forms, draperies, etc.

WHEN the actual stage of development of the majority of the class is not positively known it should be ascertained. This can only be done by testing the skill of the pupils by requiring them to draw examples under the different conditions, in regular order, beginning with the more elementary, as A, B or C, until the condition is reached under which the requirements are not understood and at command. This will mark the limit of present development.

When the stage of development of the majority of the class is known, place a chart presenting an example of the most elementary condition, the requirements of which are not understood, before the school, and interest the pupils in observing and illustrating the application of the process of drawing under that condition. Use in this way successive charts presenting different examples under the same condition until a practical understanding of the requirements of drawing under that condition is established.

In case the example given on a chart is a figure of so many lines that all of them cannot be individualized within the time of one exercise it is better, at the close of each exercise, to erase the work already done and begin the next exercise as if it was the first with that example. This is better than to add the work of each exercise to the preceding, simply with a view to completing the figure, for the reason that exercise in individualization is more important than the completion of figures; and there is much to be gained from the review which is incidental to beginning again.

Every exercise must be cheery, and the pupil must be interested enough to watch and think and take an active part. When this is not the case it is time to change the example, or the form of exercise, or the condition.

WHEN an understanding of the requirements of drawing under any condition is established, require the independent execution of examples under that condition until skill in drawing under that condition is established.

When each independent execution is completed its accuracy should be tested by the application of a transparent tracing provided for this purpose, except under Condition *J* (object drawing), where it is impracticable for the reason that, under that condition, each pupil's drawing will be different from that of every other pupil; and except, also, under Conditions A and B, in which testing is needless for the reason that under these elementary conditions errors will be so self-evident as to need no particular exposure.

SKILL in drawing under one condition having been established, place successive charts presenting examples under the next condition in order before the school, and establish a practical understanding of the requirements of drawing and how to meet them under that condition, by means of exercise in observation and illustration. This done, provide examples and require independent executions of examples under that condition until skill in drawing under that condition is established.

In this independent execution there is opportunity for freedom in the exercise of individual taste. Except in object drawing the pupil may be allowed to select his own studies and execute them in his own way, and he may keep his drawings in a portfolio or execute them directly in a drawing-book. All the restrictions, and practically all the teaching, may be confined to the illustration and observation exercises, which in every case must precede independent work.

Outlines Giving the Distinctive Features of each of the Ten Conditions

Condition A

UNDER this condition the examples are presented in the form of prints, as Fig. 1, in a color which contrasts with the neutral gray of the line made with a lead pencil, as red for example, which renders the work of the pupil more distinguishable than it could be if the examples were given in black.

Study under this condition is available as a means of developing the comprehension of the requirements of individualization under the simplest possible condition, and is adapted to the kindergarten stage of development.

CHART A^1

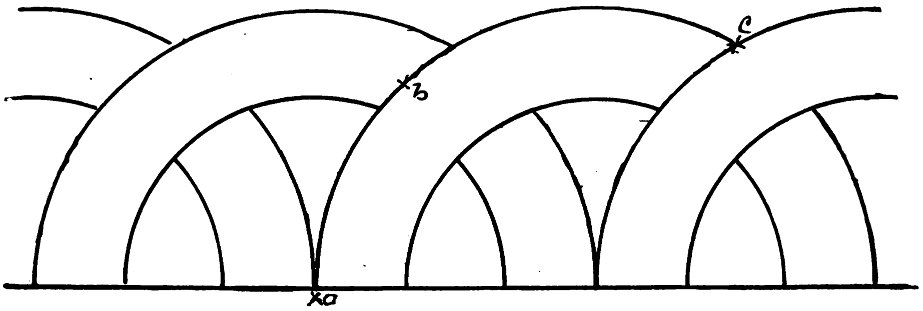


Fig. 1

The individualization, or the finding of each line, under this condition comprises three separate acts: First, running the finger-tip over the selected line from end to end; second, marking its salient points with small crosses or checks; third, neatly drawing the line between these points, and over the line itself in the example, as *a*, *b*, *c*, Fig. 1.

Study charts A^1, A^2, A^3, etc., in the order of the numerals. When the understanding of these requirements has been properly developed provide the pupils with prints to retrace independently as "busy work."

The invariable requirement is good, intelligent, painstaking work. Nothing else is worthy, and to meet this requirement a good pencil in good order is essential and it must be the care of the teacher to provide one.

Condition B

UNDER this condition the examples are presented both in a full line, as *A*, Fig. 2, and in complete plans of drawings of them; that is, in plans which give the positions of the salient points in each line in the example, as in *B*, Fig. 2.

Individualization under this condition consists in selecting a line, finding and marking the positions of its salient points in the given plan and drawing a line neatly between those points.

CHART B^{1}

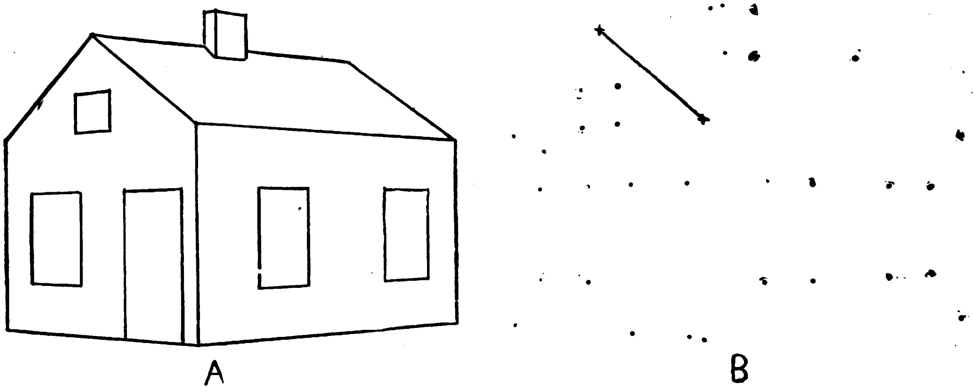


Fig. 2

Example: Suppose the line selected to be the right-hand line of the nearer gable in *A*. The individualization of this line would consist, first, in retracing it in the example, *A*, from the peak of the gable to the eave-angle and back, with the finger-tip; second, in marking the point in the plan which establishes the position of one end of it in the drawing, as the gable-peak for example, with a cross, and then marking the point which establishes the position of the eave-angle, or the other end of the line, in the same way; and, third, in drawing the line between those points, as shown in *B*. This process is repeated, the teacher and different individual pupils individualizing different lines. If all the lines in the example are individualized before the time-limit of the exercise is reached erase what has been done and begin again.

Good work should be insisted on in every case, but allowance must be made for unavoidable want of manual skill; that is to say, the lines must begin right and end right, but if they are not as straight or regular as might be wished it is excusable at this stage, and may be overlooked, but it should not be made of little importance.

Study charts B^1, B^2, B^3, etc., in the order indicated by the numerals, until complete intelligence to the extent of a full understanding of the requirements under this condition is well established.

When the understanding of the requirements has been properly developed, provide the pupils with prints presenting attractive examples under this condition for independent execution.

The primary aim of exercise under this condition is the establishment of the habit of deliberation. By means of class work in which the pupil sees lines individualized under the condition which requires only the finding of given salient points he will learn four things: First, that in every subject there are lines whose positions are more unmistakable than others; second, that each line individualized makes the positions of other lines unmistakable; third, that, since he is able to individualize those lines first that are most unmistakable in their positions, and also since each line executed makes the position of other lines more unmistakable, the execution of the drawing presents no difficulties that he cannot overcome; and, fourth, that all depends upon finding out what to do and how to do it before beginning to execute.

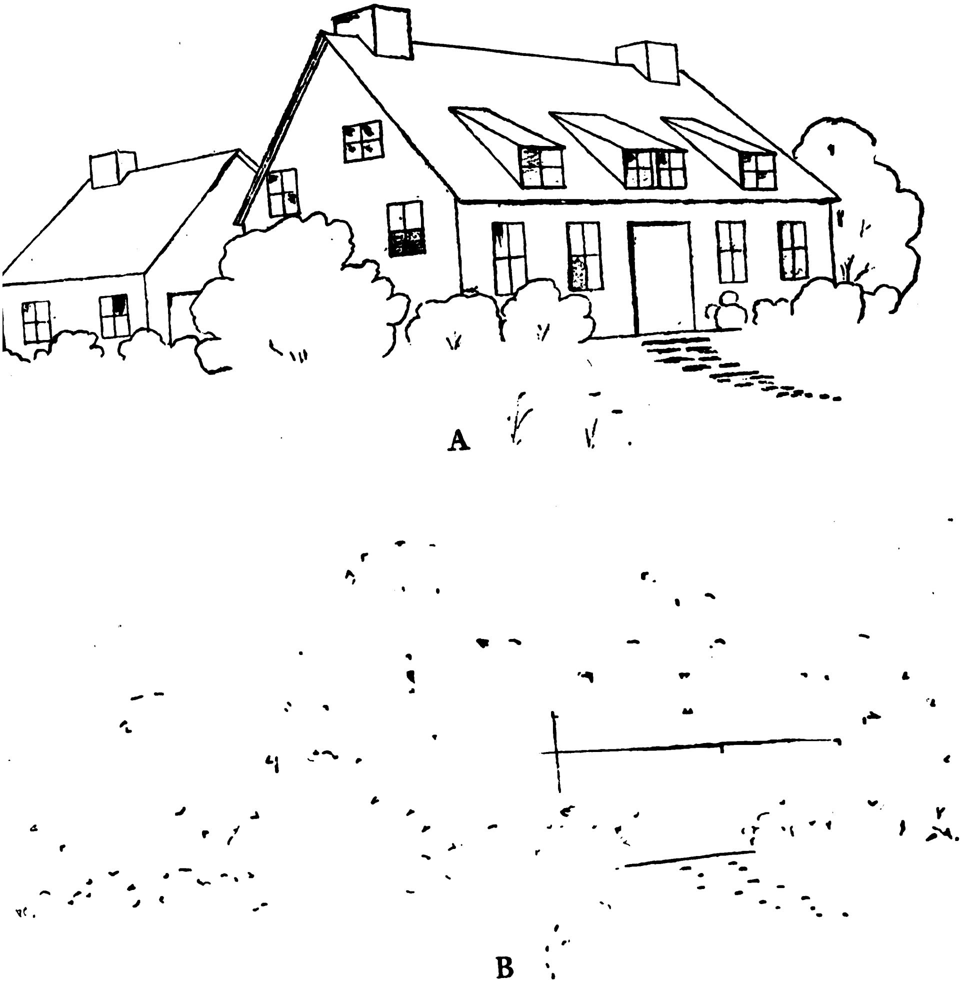


Fig. 3

Condition C

UNDER this condition the examples are presented in full drawings, and in plans that are incomplete in that they do not give the positions of the salient points of every line; but yet do give that by means of which the positions of the salient points not given may be found without recourse to measuring, as in *A* and *B* in Fig. 3.

Individualization under this condition consists in selecting the line, planning for its drawing by finding the positions of its salient points, marking them, and drawing the line through the marked points.

Under this condition the omitted salient points may be found by what may be called the system of ranges, and every point omitted is selected for omission because its position in the drawing can be found by drawing two lines through other points with which it is in line or range.

Example: The position of the upper right-hand corner of the second window to the left of the front door is not given in the plan *B*, but this omitted point is in line or range with the top of the front door and the tops of the other windows on either side of the front door, and it is also in a vertical line with the left-hand side of the left-hand dormer window. The position of the upper right-hand corner of the front door is given, the upper right-hand corner of the second window to the right of the front door is given; draw a line through these two given points as in *B* and it will contain the omitted point it is desired to locate. The lower left-hand corner of the left-hand dormer window is given. Draw a vertical line from this given point downward, as in *B*, and it will contain the point it is desired to locate. The omitted point will be found at the intersection of these two lines.

Every point not given in the plan *B* can be located in a similar way.

CHART C^1

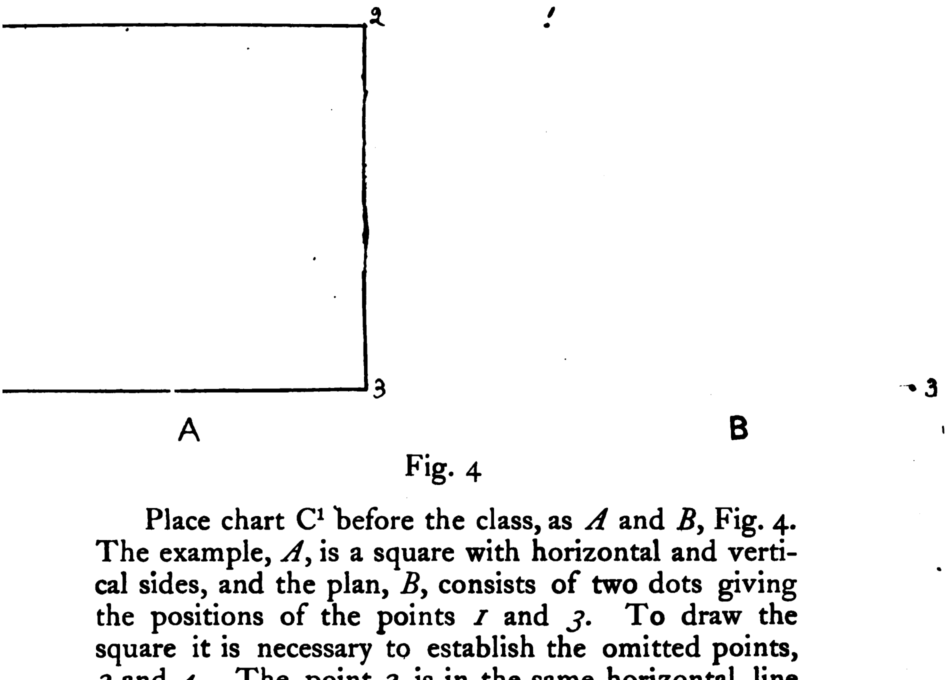


Fig. 4

Place chart C^1 before the class, as *A* and *B*, Fig. 4. The example, *A*, is a square with horizontal and vertical sides, and the plan, *B*, consists of two dots giving the positions of the points *1* and *3*. To draw the square it is necessary to establish the omitted points, *2* and *4*. The point *2* is in the same horizontal line with point *1*, and in the same vertical line with point *3*. To find the position of point *2*, draw a horizontal line to the right from point *1*, and a vertical line upward from point *3*. Point *2* is at their intersection. Point *4* is found in a similar way.

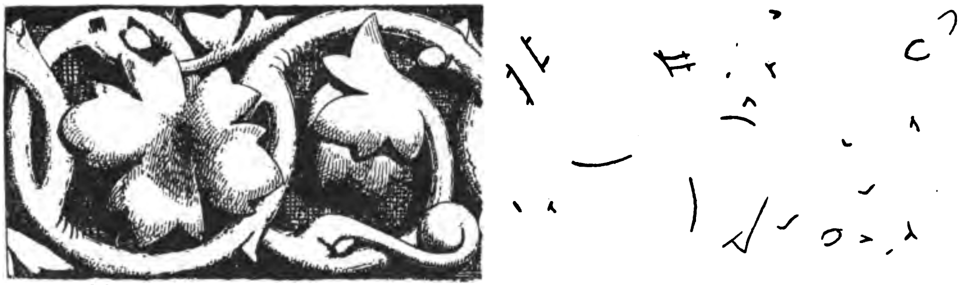
Exercise under this condition is very important, and may easily be made very interesting. It is important because it exercises the faculty of discovering the relation of things, and because it stimulates the observation of relations. No skill in drawing is practical except in the degree that the faculty of discovering the relative positions of points and lines, as well as of using them in executions, is developed. Exercise under this condition may be made most interesting, in the class exercises, by the use of more complicated examples rather than simpler figures, by impartially giving every one an equal opportunity to illustrate how he would proceed to find points or to individualize lines, and giving due credit for businesslike accuracy as well as for every evidence of thoughtfulness, assisting sparingly, and insisting upon no set form of phraseology. Study charts C^1, C^2, C^3, etc., in succession, and then provide the examples for independent execution.

Condition D

MEASURING enters so largely into drawing as to almost constitute the whole of it. The expert draughtsman measures by comparisons, or relatively; that is to say, he estimates individual distances to be relatively so much, or so many times, more or less than other individual distances, and the degree of his skill in drawing depends, primarily, upon the accuracy with which he does it; and the artist estimates distances and relations with a subtle accuracy that mechanical measurement cannot approach, but it is no accident. The beginner has not had experience or instruction. He thinks he knows how to measure, but, unless his temperament is exceptional or his training has been particularly fortunate, he knows measuring only as a form. He has no adequate comprehension of the deliberation and accuracy required to render it of any value. But he may learn, and the first step in this direction is to learn what measuring consists in, how to proceed in it, and how necessary it is to do one thing at a time thoroughly well, by learning to measure mechanically. This requires that the pupil shall have a good pencil in good order and a measuring slip of *thin*, *tough paper*, *single thickness*, and with *straight edges* and *square corners*, for every possible cause of error but the one must be eliminated.

The average individual, naturally, or it would be nearer the truth to say ignorantly, is inclined to indifference; he does not discriminate between doing and simply going through the form of doing; and nowhere is this more in evidence than in the matter of measuring. Learning to draw is bound up in learning to do things right—to do things right the first time; and this is the time and place to begin and do the most substantial kind of work. The value of thorough work in this connection cannot be overestimated.

Under this condition the examples are presented in full drawings and in incomplete plans, the omitted points of which can be found by drawing horizontal and vertical lines and making two measurements, as in Fig. 5.



Adapted from Collings' Medieval Foliage

Fig. 5

Place the chart D¹, before the class. The example is presented as shown in *A* and *B*, chart D¹, Fig. 6.

The points *1* and *3* are given, and the points *2* and *4*, which are essential to the drawing of the figure, are omitted, in the plan *B*. The drawing of either of the lines in this figure necessitates the finding of either the point *2* or the point *4*. Suppose the line selected to be the line *1–2*. The point *1* is given, and the point *2* is to be found.

From *1* in *A* drop a vertical line, as in *A'*, Fig. 7, and from *1* in *B* drop a vertical line, as from *1* in *B'*. From *2* in *A* draw a horizontal line to the left, as in *A''*. Measure from *1* in *A* downward, on the vertical to its intersection with the horizontal line from *2* at 5, by marking the distance *1–5* off on the edge of a slip of paper, and set that distance off from *1* in *B*, as *1*–5 in *B''*. Through this point 5 in *B''* draw a horizontal line to the right, as in *B'''*. Measure the distance from *5* to *2* in *A*, as in *A''*, and set the distance off from *5* in *B* on the the horizontal line, and establish the point *2*, as in *B''''*. Draw a line from *1* to *2* in *B*, as in *B'''''*. This line *1–2* is fully individualized and installed in *B*. The point *3*, being given, the individualization of the line *3–2*, now that the point *2* is established, consists simply in identifying its ends and joining them. Individualize the lines *1–4* or *4–3* in the same way that *1–2* was individualized, or it may be individualized, in the same way, by working from the point *3* instead of from point *1*.

Study charts D^1, D^2, D^3, etc., and establish complete understanding. And then require independent executions until skill in measuring is established.

CHART D^1

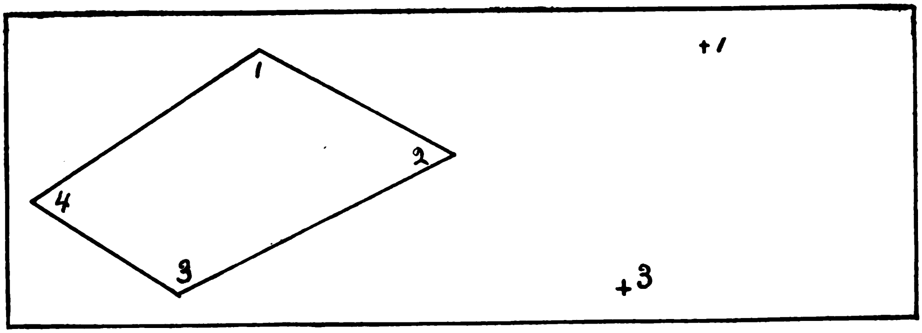


Fig. 6

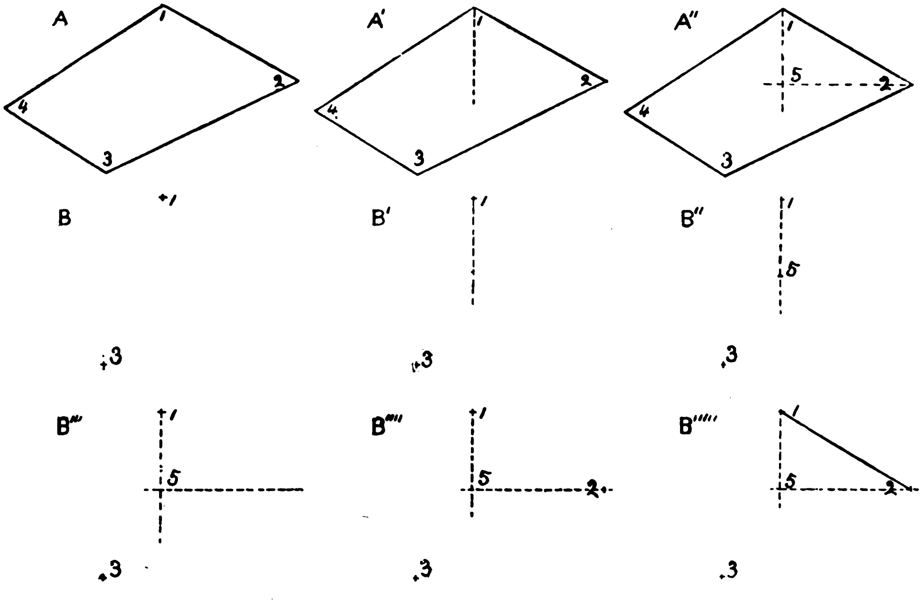


Fig. 7

Condition E

UNDER this condition the examples are presented in full, and with coördinate axes which constitute a basis of measurements by means of which the relative positions of any or all points or lines in the subject (which under this condition is facsimile of the example) may be accurately determined. Figs. 8, 9, 10 and 11.

Drawing by the system of coördinates necessitates the making of measurements perpendicularly to the axes, and the establishment of a sufficient number of salient points to insure accuracy in the principal proportions. But it does not require that each and every point shall be slavishly established in that way. Indeed, as many points as practicable should be established without mechanically measuring, by simply estimating or judging as to their positions with reference to other points already established, and the nearer a drawing approaches completion, and the more points there are established, the more opportunities there will be in which it is safe to estimate rather than measure, and the oftener it should be attempted; but there must be accuracy. Exercise under this condition affords opportunity for choice as to what points shall be established mechanically and what points it is expedient to establish without recourse to actual measurement, and it is better, as a rule, to establish extreme points or the larger dimensions first. The exercise of this choice is very essential, but it requires an understanding of the system of procedure, and to insure the development of the comprehension of what is required, before throwing the necessity for choosing the salient points entirely on the pupil, the examples under this condition are presented in three successive ways.

The First Way: In the first of these ways the salient points are indicated by numerals, and the coördinates along which measurements are to be made, and the axes are given, as in Fig. 8. Examples presented in this way are indicated as E^{a1}, E^{a2}, E^{a3}, etc.

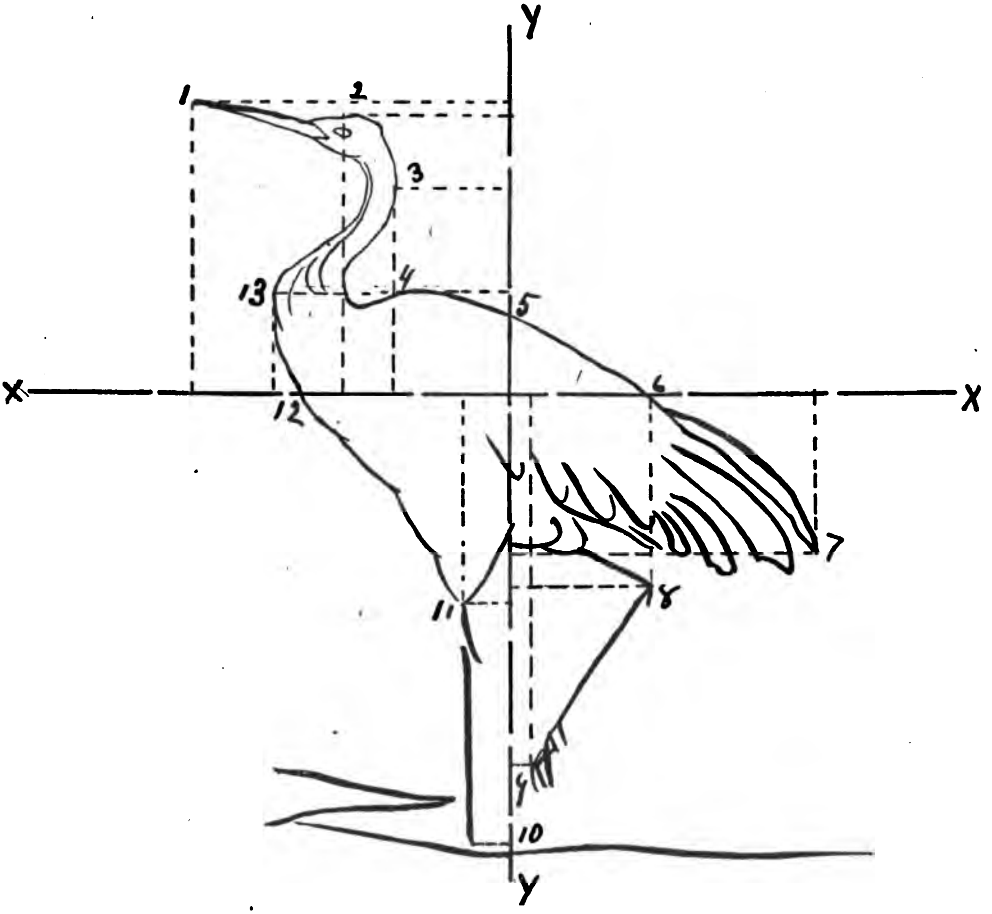
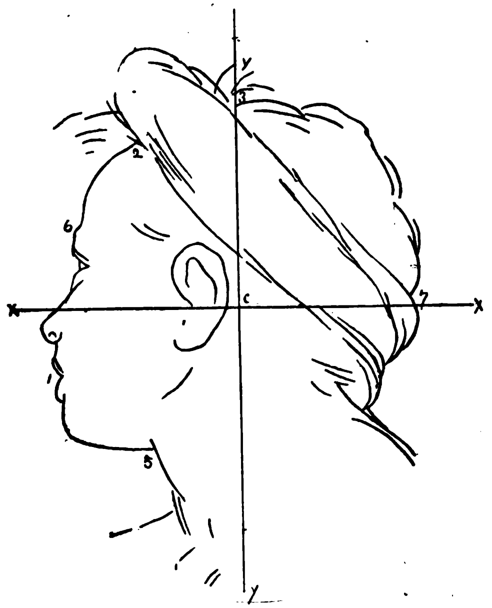


Fig. 8

The Second Way: In the second of these ways the salient points are indicated by numerals, and the axes are given, but the coördinate lines are omitted, as in Fig. 9. Examples presented in this way are indicated as E^{b1}, E^{b2}, E^{b3}, etc.

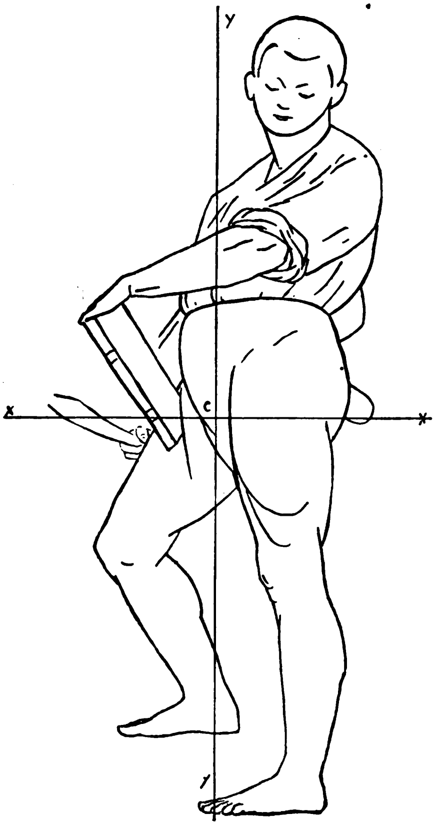


Adapted from a study by Andrea del Sarto.

Fig. 9

The Third Way: In the third of these ways the axes are given, but the salient points are not indicated, it being left for the pupil to select them for himself, as in Fig. 10. Examples presented in this way are indicated as E^{c1}, E^{c2}, E^{c3}, etc.

Place chart E^{a1}, Fig. 11, before the class. The



Adapted from a study by Fra Bartolommeo.

Fig. 10

problem is to establish four points, *1*, *2*, *3* and *4*, having the same relations to X^2 and Y^2 that points of the corresponding numerals have to X and Y. The process of doing this consists in measuring coördinates, drawing parallels and establishing their intersections.

Example: To reproduce the relations of the point *1* to X and Y, measure from *1* to Y, along the dotted horizontal line with a measuring slip, set that distance off from Y^2 in two places, as at *A* and *B*; through *A* and *B* draw a line parallel with Y^2; measure along the dotted vertical line, from *1* to X on the measuring slip, set that distance off from X^2 in two places, as at *C* and *D*, through *C* and *D* draw a line parallel with X^2. The point where these two parallels with X^2 and Y^2 intersect will have the same relation to X^2 and Y^2 that the point *1* has to X and Y.

The setting off of each coördinate measurement in two places, and the drawing of parallels with the axes, is important in showing the pupil the way in which error is to be most guarded against, and should be insisted upon in all illustrations, in class exercises. But in independent execution it is well not to insist too much upon any particular detail of method. It is a good plan to leave the pupil largely to his own devices in independent work, holding him strictly accountable only for the accuracy of his results.

Study individualization of lines from charts presenting examples under Condition E^a, as shown in Fig. 8, in the order of the numerals, in class exercises until the uniform promptness and accuracy is sufficient to prove that the comprehension is fully awake to the requirements.

CHART E^{a1}

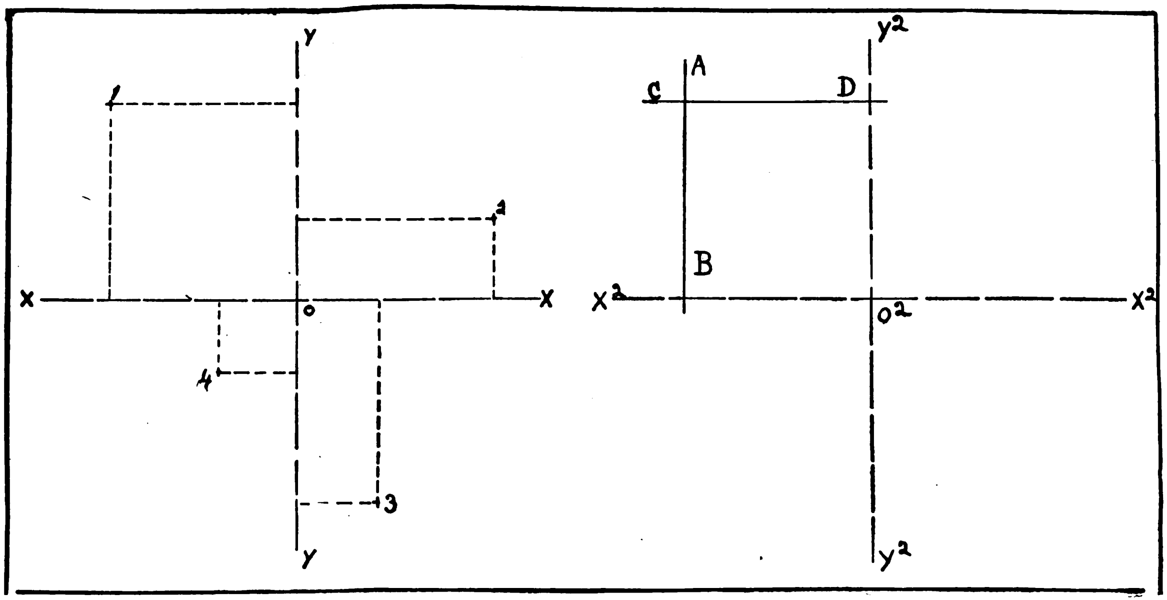
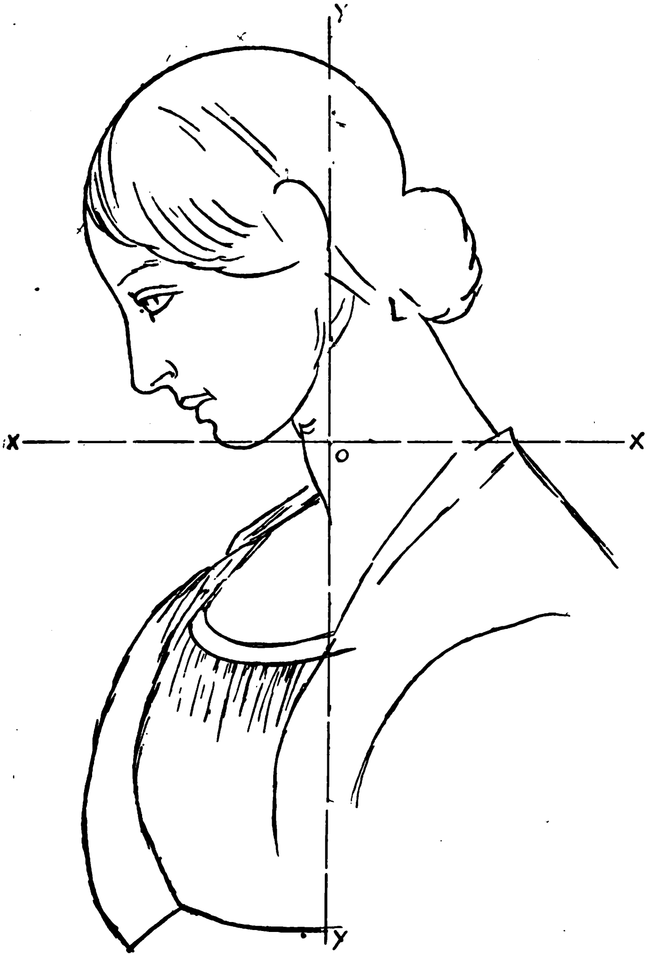


Fig. 11

When the understanding of requirements is established, provide attractive examples presenting figures under this condition and require independent executions until the results show that the pupils understand the requirements and are able to use effectively the means of meeting them. When the results show that this has been accomplished, take up the study of the individualization of lines in examples presented, as in Fig. 9, and after that as presented in Fig. 10.

Nothing is good enough in drawing that is not right. The pupil has the means of doing everything right, he knows how, and nothing else should be tolerated. The teacher should be provided with a transparent tracing of each of the examples provided for independent execution, and on its completion the accuracy of every drawing should be tested by the application of a tracing of the example, and it should be required to be reasonably near to the standard. It would be unreasonable to expect absolute accuracy. It should not be demanded that each drawing on being tested with the tracing shall perfectly "justify" with it, as the printers say, but it should "justify" with it sufficiently to prove a reasonable care. It has been found to be a good rule to accept whatever comes within 1/8 of an inch of being absolutely accurate in every respect, to reject everything that exceeds this variation in any one respect, and to require rejected work to be re-executed, not mended.



Adapted from a study by Raphael.

Fig. 12

Condition F

UNDER this condition the examples are presented in full drawings with coördinate axes as in Fig. 12, and it is required to reproduce them in doubled dimensions.

Place Chart F^1, Fig. 13, before the class and illustrate the process of drawing to doubled dimensions.

Example: Select a point, as *1*, measure the distance from *1* to Y on the measuring slip, set that distance off twice from Y^2 in two places as in A^1, A^2, and B^1, B^2, and through A^2 and B^2 draw a parallel with Y^2; measure the distance that *1* is from X, set that distance off twice from X^2 in two places as in C^1, C^2, and D^1, D^2, and through C^2 and D^2 draw a parallel with X^2. The intersection of the parallels, A^2, B^2, and C^2, D^2, will establish a point which has the same relations to X^2 and Y^2 that the point *1* has to X and Y, but in doubled dimensions.

Select and establish other points in the same way.

Proceed as in preceding conditions.

CHART F^1

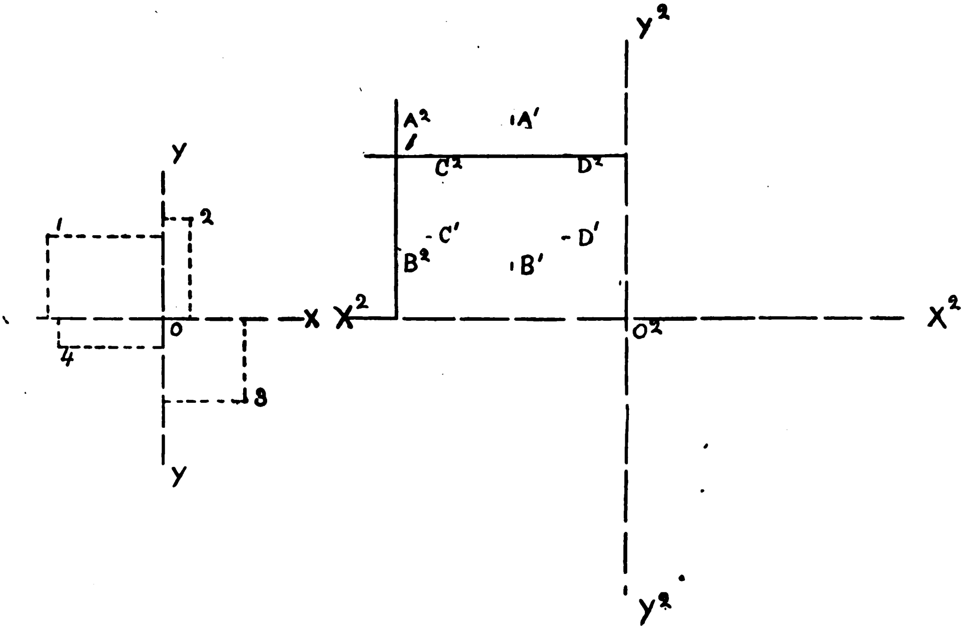


Fig. 13

Condition G

UNDER this condition the examples are presented in full drawings with coördinate axes as in Fig. 14, and it is required to reproduce them in halved dimensions.

Place Chart G^1, Fig. 15, before the class and illustrate the process of drawing to halved dimensions.

Example: Measure the distance from 1 to Y with a slip of thin, tough paper, divide that measure into equal parts by folding it in the middle. Set one of the half distances off from Y^2 in two places, as at A and B, and draw A–B parallel with Y^2. Measure the distance that the point 1 is from X, divide that measure into two equal parts by folding it in the middle, set one of these half distances off from X^2 in two places and draw C–D parallel with X^2. The point of intersection of the parallels, AB and CD, will establish the position of a point that has the same relations to X^2 and Y^2 that the point 1 has to X and Y, but in halved dimensions.

Select and establish other salient points in the same way.

It will be well in drawing under this condition to look to the folding of the measures. Measures should be folded accurately, otherwise they are useless. In the class exercises it will be easy to note the folding of measures, and correct any want of understanding regarding the importance of accuracy or any clumsiness of method. The measuring slip used in class work must be *paper* and not string nor cloth.

The pupil must realize that it is vastly better to do nothing than it is to do anything inaccurately, and it is a mistake to call inaccuracy by any other name, such as carelessness or heedlessness, for it is not either of these.

CHART G^1

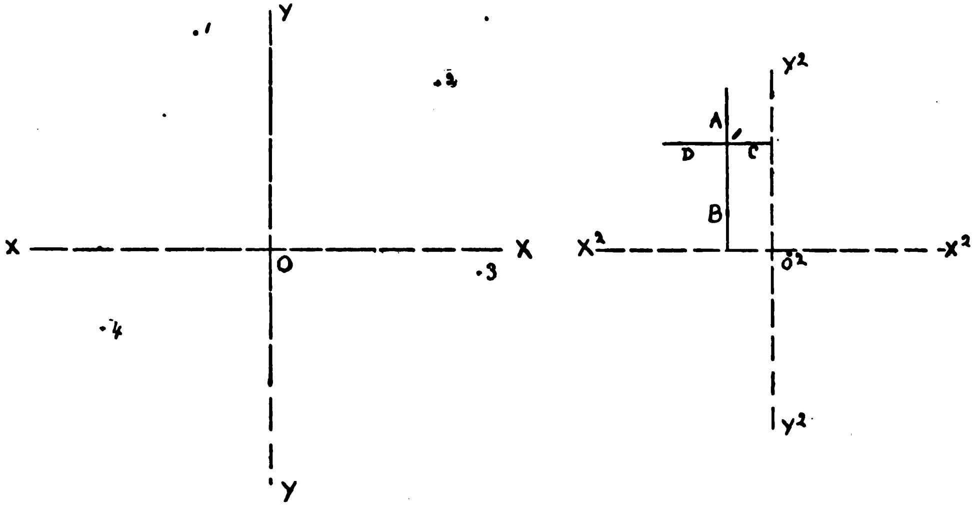


Fig. 15

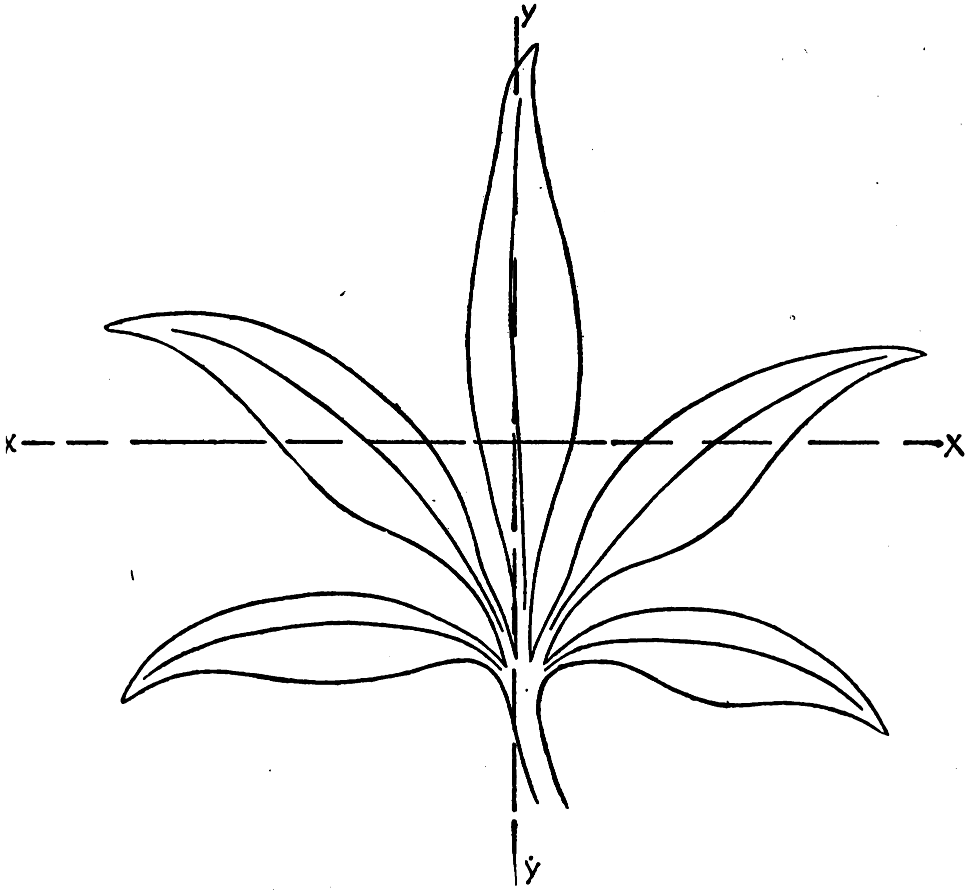
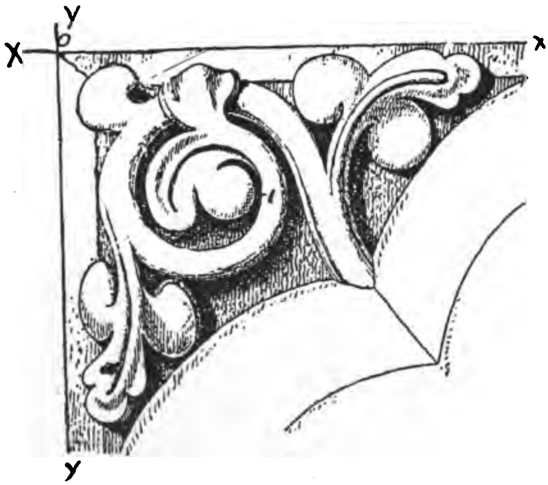


Fig. 14

Condition H

UNDER this condition the examples are presented in full drawings with coördinate axes as in Fig. 16 (the axes may be taken anywhere, in this figure they are taken along adjacent edges of the example) and it is required to reproduce them in either enlarged or reduced dimensions, or it is required to "draw to a pitch," as it is called.



From Collings' Medieval Foliage.

Fig. 16

Drawing under this condition is only different from drawing to doubled and halved dimensions (the two preceding conditions) in that it requires the preparation of scales, for the reason that when the ratio between the dimensions of the example and the dimensions of the drawing is anything else than two, or one-half, the making of the drawing is impracticable without the help of prepared scales of measure, except to the expert, and not even to him when the case requires mathematical accuracy, as in architectural and machine drawing.

The drawing to doubled and halved dimensions is drawing to pitch, and in the degree that it has been mastered, drawing to any pitch, as under this condition, will be simplified.

The scale which is used in the determination of dimensions of the subject is called the subject scale, and the scale which is used in the establishment of dimensions in the drawing is called the drawing scale. The development of an understanding of the requirements of drawing to pitch is best promoted by the making of these scales and using them after they are made.

CHART H^1

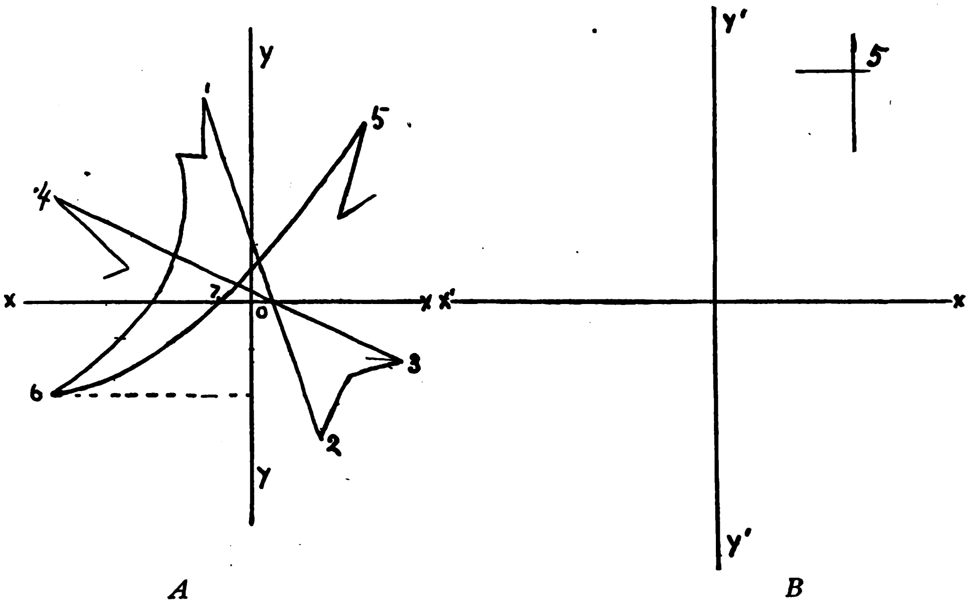


Fig. 17

The Making of Scales

SUBJECT Scale: Make any simple scrawl on the blackboard as the example; through it draw the axes, *X* and *Y*, horizontal and vertical, and draw the axes X^2 and Y^2, also horizontal and vertical, to the right of the example, or place Chart H^1, Fig. 17, before the class. Take either coördinate of any point in the example as the unit, as *6 Y*. Fig. 17, and set that distance off at one end of one edge of a slip of firm paper that is perhaps two inches wide and eighteen inches long, and mark it "subject scale," as in Fig. 18. Divide this unit distance into some equal number of parts, as four, and number the division from left to right as 1, 2, 3, 4, as in Fig. 19. Produce this divided unit one or more times and number the divisions, as in Fig. 20.

Drawing Scale: Determine the dimension of the unit of the drawing scale; that is, determine whether the coördinate, *6 Y*, in the drawing is to be longer or shorter than the coördinate *6 Y* in the example, and how much.

Having decided upon the dimension the coördinate of this point, which is to be the unit of the scale, is to have in the drawing, set that distance off at the end, of the opposite edge, of the measuring slip from the subject scale, and label it "drawing scale," as in Fig. 21.

This is the unit of the drawing scale. Divide this unit into the same number of equal parts that the unit of the subject scale was divided into, produce it one or more times, and number the divisions consecutively from left to right, as in Fig. 22.

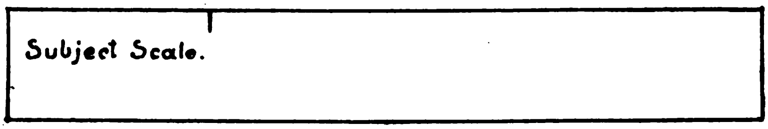


Fig. 18

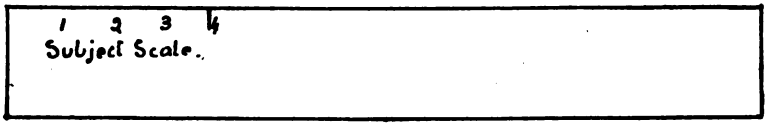


Fig. 19

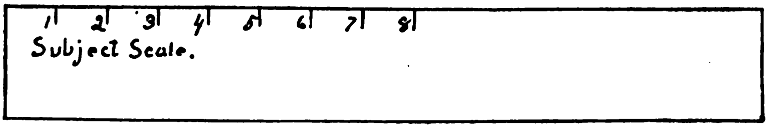


Fig. 20

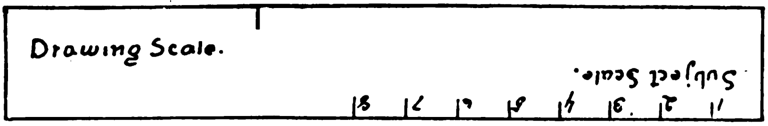


Fig. 21

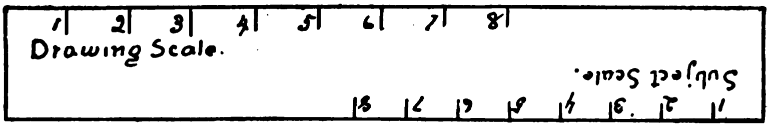


Fig. 22

Illustrate the individualization of points and lines to pitch by measuring the coördinates of salient points in the example by the subject scale, and setting off the dimensions of the corresponding coördinates in the drawing by the drawing scale.

Example: The horizontal coördinate of the point 5, or $5\ y$, in the example, measures 2¼ divisions on the subject scale. Set off from Y', to the right hand, 2¼ divisions by the drawing scale and draw a line parallel with Y'. The vertical coördinate of 5, or $5X$, measures a little more than 3½ divisions on the subject scale. Set off from X', upward, a little more than 3½ divisions on the drawing scale and draw a line parallel with X'. The point of intersection of these parallels establishes the position of a point which has the same relation to X' and Y' that the point 5 has to X and Y, but in different dimensions, to a given pitch.

Establish other points in the same way.

It is a good plan, having taken any figure as the example, to make the scales, and then to use the same scales in repeating the drawing of the same example as many times as practicable; after this, take the coördinate of another point as the unit and make another pair of scales, and draw the example again as many times as practicable, using the new scales. Make scales in which the unit of the drawing scale is larger than the unit of the subject scale, as well as scales in which the unit of the drawing scale is smaller than the unit of the subject scale.

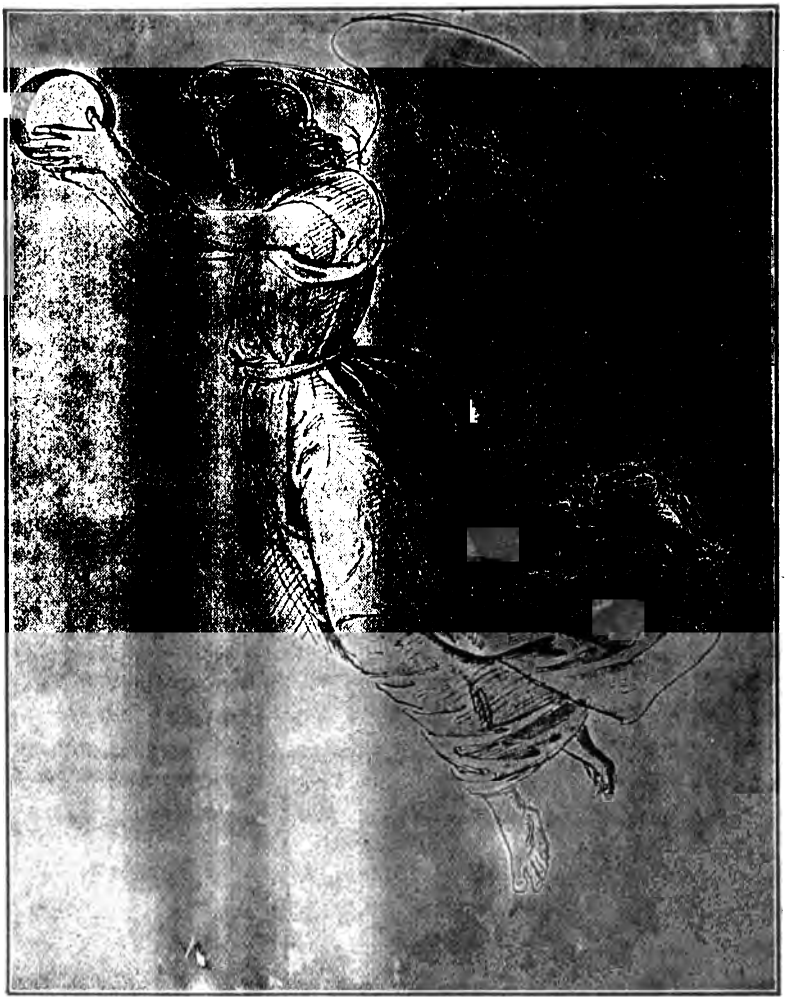
When the pupils have come to understand the making of scales and how to use them in making drawings of simple figures to a given pitch, and can make enlarged or diminished drawings, they should be given more interesting studies. To this end the teacher should be provided with an assortment of interesting examples, and a transparent tracing of a drawing of each example made to a different pitch from that of the example itself.

In this independent practice there are several ways to proceed, each of which should be tried in turn.

The First Way: The teacher selects the example to be drawn and gives each pupil a copy, names the coördinate (better a long than a short one) the length of which is to be the unit of measure, and gives the dimension in inches and a fraction, if there is one, that this coördinate measure in the *tracing*, as the unit of the drawing scale. With this data the pupil proceeds to make the necessary scales, and to execute the required drawing. When the drawing is completed the teacher tests its accuracy by applying the tracing. If the resulting drawing is not reasonably accurate it should be remade. There should be no mending of poor work allowed.

The Second Way: The unit of measure may be not only the dimension of a coördinate, but it may be the distance between any two points whatever, and if these points are at a considerable distance apart it is better than if they are too near together. The teacher selects the example and gives each pupil a copy, names the points the distance between which is to be the unit of measure, and gives the measure in inches and a fraction, if there is one, of the distance between the two chosen points, measured on the *tracing*, as the unit of the drawing scale. With this data the pupil proceeds to make the required scales and draw the example assigned, the result, on completion, to be tested as above described.

The Third Way: The teacher allows each pupil to choose his example for himself, but assigns some dimension of the tracing as the pitch, and with this data each pupil makes the required scales, executes the drawing, and subjects it to be tested by the application of the tracing in the hands of the teacher.



Study of an angel. By Raphael.

Fig. 23

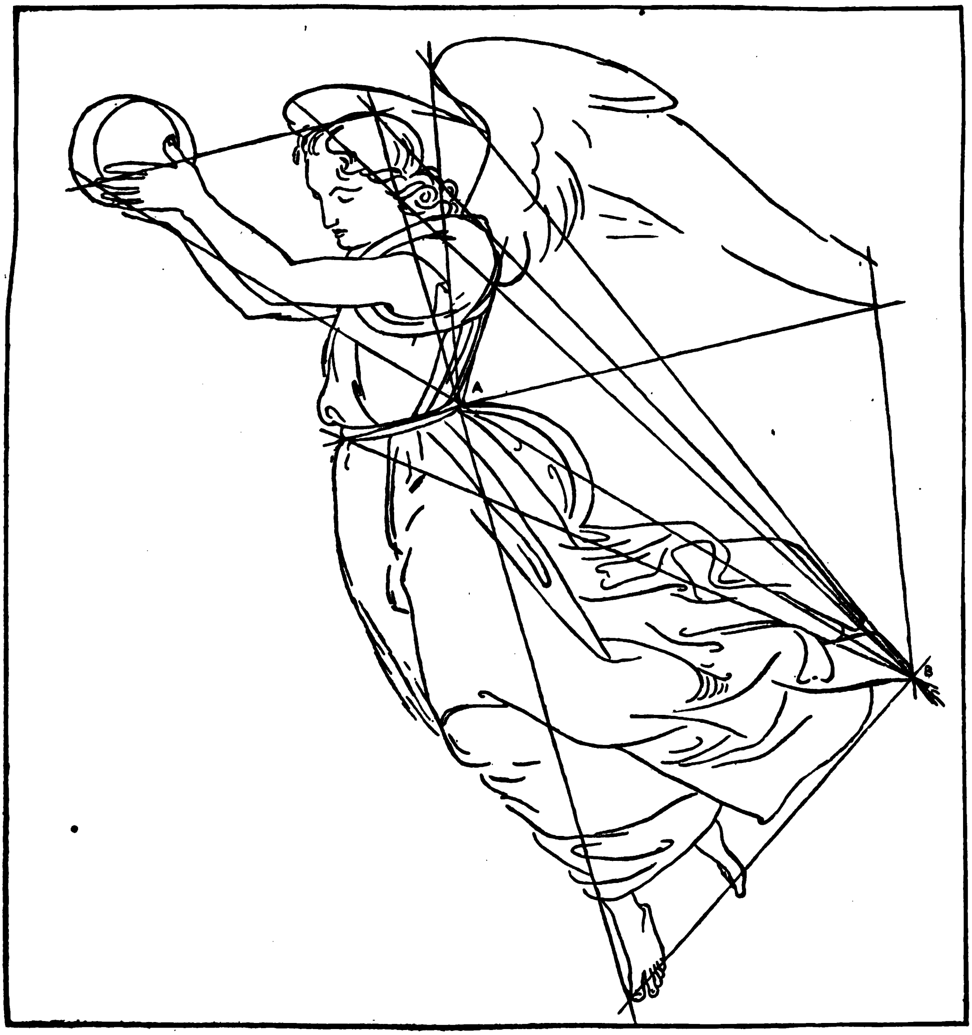


Fig. 24

Condition I

UNDER this condition the example is presented simply by itself, as in Fig. 23.

The individualization of lines under this condition is accomplished by means of triangulation, or the system of paralleling.

Example: Draw any scrawl on the blackboard, or place Chart I[1] before the class as Fig. 25. Select any two points as *A* and *B*. These two points are related in the direction that one is from the other. That is to say, a line from *A* to *B* would have a certain direction. If a line were drawn paralleling that direction, as *A′–B′*, that line would contain points lying in the same directional relation as *A* and *B*. Draw such a line and set off two points in it as *A′* and *B′*. This line between these two points constitutes a basis of the drawing. If it is parallel with the direction in which *B* lies from *A* then a drawing of which it is the basis may be right, but if it is not parallel with the direction from *A* to *B* the drawing made on it will not be right.

With this line *A–B*, as a basis, select another point as *D* for individualization. This chosen point *D* lies in a given direction from *A* and in another given direction from *B*. If a line is drawn from *A′* that is parallel with the direction that *D* is from *A* then that line will contain the point *D′*. Draw the line *A′–D′* parallel with the line *A–D*. If a line is drawn from *B′* that is parallel with the direction that *D* is from *B*, then this line will contain the point *D′*. Draw the line *D′–B′* parallel with the direction that *D* is from *B*.

The point of intersection of the line *A′–D′* with the line *B′–D′* establishes the position of a point *D′* which has the same relations to *A′* and *B′* that the point *D* has to *A* and *B*. Continue this process until the salient points of the drawing are established and then, with these points as a basis, execute the drawing.

It will be seen that drawing under this condition depends upon skill in paralleling, and is the farthest possible removed from anything mechanical. It is strictly free-hand drawing, and the more the pupil does of it the more skillful he will become. The pupil who has mastered drawing under the preceding conditions will quickly learn to draw by triangulation; but, except something equivalent to the mastery of drawing under the preceding conditions has previously been accomplished, the teaching of drawing by trian-

CHART I[1]

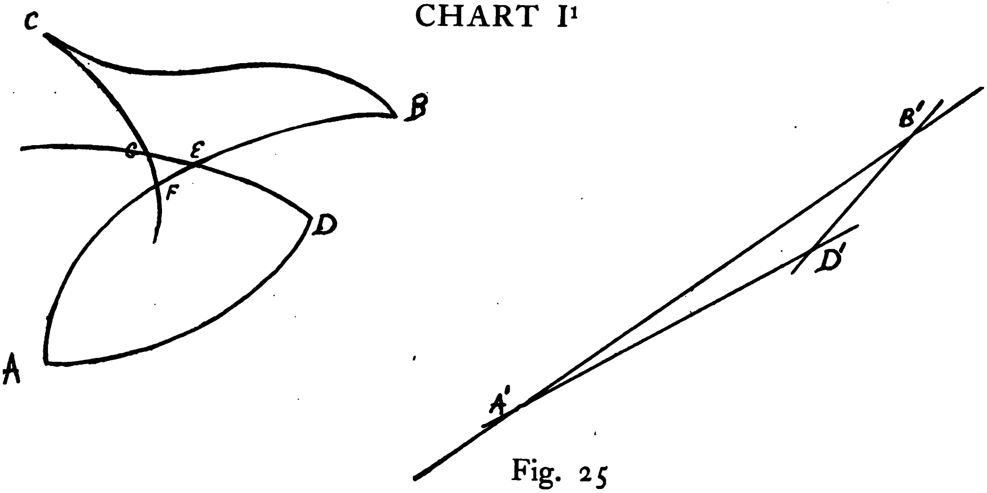


Fig. 25

gulation is impracticable, for the reason that the deliberation and precision it requires cannot be understood, and will not be given to it, by the average pupil.

Have the pupils draw off-hand scrawls, or other simple examples, of not more than four lines each, by triangulation, both on paper and on the blackboard, until a proper understanding of requirements has been developed, and when this has been accomplished the pupil should be provided with good and interesting examples for independent execution. To this end the teacher should be provided with an assortment of the best examples to be procured, such as those prepared by Prof. Charles H. Moore and published by Houghton, Mifflin & Company, and a transparent tracing of a drawing of each different example which is either larger or smaller than the example itself.

In this independent work it is optional with the teacher to assign the same example to the entire class, to assign different examples to different pupils, or to allow each one to choose; but in making each assignment the teacher must assign the line between which two points is to be the basis of the drawing, and give its length in inches, which must be the distance between the two selected points *measured on the tracing.*

The pupil having received the example he is to draw and having been informed as to what line is to be the basis of the drawing as well as its length, draws a line paralleling the direction between the given points in the example, sets off the given dimension on this line and with this line as a basis executes the drawing.

When the drawing is completed its accuracy should be tested by the application of the tracing in the hands of the teacher.

Condition J

UNDER this condition the example is an object, or group of objects. If there are several pupils in the class each one will see the object from a different point of view, and the real subject of each drawing will be peculiar to the respective point of view. Because of this, different pupils will have different drawings of the same model, and for this reason class exercises in the form in which they have been practicable under the preceding will not be available under this condition, and whatever instruction is given under this condition must be individual.

The individualization of lines under this condition involves their first being silhouetted, and it is this silhouetting of lines and forms that constitutes the characteristic feature of object drawing. The awakening of comprehension to the necessity for this silhouetting is expedited and rendered wholly practicable by dividing the background into equal squares, providing the pupil with quadrille-ruled paper, and instructing him in observing what squares on the background are wholly or partially hidden by the visible faces of the object, and in outlining spaces on his paper including similar whole or partial squares. These outlines, it will be seen, constitute a drawing of the object; they are not copies of the forms of the visible faces of the object which they represent, but they are copies of the forms of the silhouettes of the visible faces of the object from a given standpoint.

Under these conditions the divided background behind the object acts as a conveyor of the thought and observation of the draughtsman to the silhouette forms of the object or the facsimile of the real subject of the drawing; the quadrille-ruled paper facilitates the copying of these silhouette forms of the object; and the quadrille-ruled paper and background together irresistibly expedite the development of that comprehension of the requirements of object drawing which constitutes intelligence in object drawing, and the establishment of that kind of ability which constitutes skill in object drawing.

Experience has proven that this intelligence may be speedily developed by the means that have been described, and it has been proven, also, that he who has arrived at the stage of intelligence in object drawing cannot be turned back, but that whatever the circumstances may be he will copy the silhouettes of the forms of the objects and never attempt to reproduce the forms of the objects themselves, for the reason that he knows that that is not what object drawing consists in, even if he does not know that it cannot be done.

The passing from the drawing of objects under the condition that special facilities in the form of a special background and specially prepared paper are provided, to the drawing of objects under the condition that no special facilities are provided, is, however, something of a step, and though it is practicable to take this step all at once it is not necessary to do so, as it may be taken by degrees, or in three partial steps, instead of in one whole step. The first of these three partial steps consists in drawing under the condition that a quadrille-ruled background is provided and the drawings are made on quadrille-ruled paper, until intelligence as to the requirements of object drawing with the aid of these facilities is fully established; the second of these steps consists in drawing under the condition that a quadrille-ruled background is provided, the horizontal and vertical lines of which will assist the pupil in determining the silhouette relations, but the drawing is made on unruled paper, which affords no assistance in reproducing silhouette relations, until the capability to draw under this condition is fully established; the

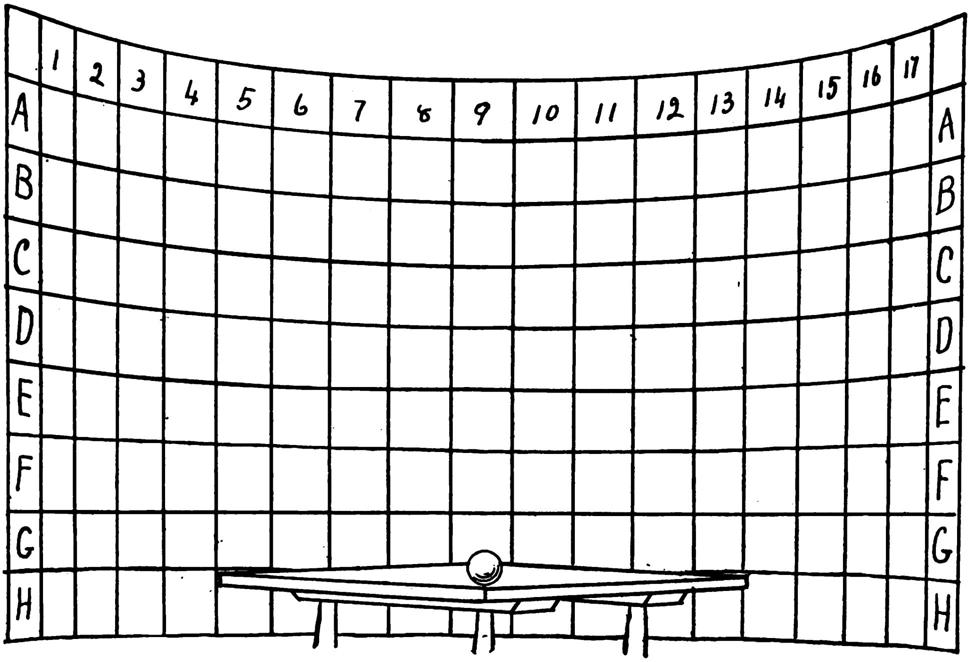


Fig. 26

Pat. Dec. 9, 1902

third of these steps consists in drawing from objects under the condition that no special facilities are provided, until the capability to draw under that condition is fully established.

A very convenient form of divided background may be made by ruling a sheet of cloth into five-inch squares and suspending it from the wall in front of which the objects to be drawn are placed. Such a background screen is wholly practicable and effective as a conveyor of thought and a director of effort, but it has a fault, due to its shape. A screen of this kind is necessarily flat, and because it is flat, drawings made with its help are distorted in that they are too wide for their height, except they are made from a position on a line through the middle of the object, and perpendicular to the screen; but this fault is avoided by curving the screen in the horizontal plane as shown in Fig. 26. Such a curved screen presents a practically perpendicular background from a very large number of points of view; drawings made according to it will not be distorted, and it is therefore adapted for use in the instruction of large classes.

Suggestions to the Teacher

WHAT is required in object drawing is simply a distinct comprehension of the fact that the drawing of an object is a copy of the forms of the silhouettes of its visible faces, and cannot be a reproduction of the forms of the visible faces of the objects themselves. The teaching of object drawing begins and ends with convincing the pupil of the truth of this fact.

It is the teacher's business to bring the pupil to this state of intelligence. It is the privilege of him who has arrived at this state of intelligence to develop and cultivate his skill to almost any extent he may desire; but to him who has not reached this state of intelligence, object drawing is a closed book.

The reforming of the pupil's conception of object drawing is more expeditiously accomplished by means of a succession of shocks than it is by gradual approach. These shocks are administered by placing the object before the pupil so as to present as much foreshortening as practicable; a simple square table, the top of which is only slightly below the level of the eye, is a very excellent object for this purpose, and the less it is below the level of the eye the better it is, so that it is below at all. The pupils know that the top of the table is square, and in the degree that they are untrained in object drawing they expect that the drawing of the top of the table will be square; in fact they are sure of it—so sure of it that they will not look or consider—but, according to the background screen, the drawing of the table top comes out not a square but something very different and the pupils are shocked and startled, and begin to look and think. The repetition of this shock hastens the comprehension of the real requirements, while the opposite course of avoiding foreshortening, in the beginning, only serves to perpetuate misunderstanding, if not wholly to arrest progress.

By a short but vigorous and aggressive study of the foreshortening of sticks, boards, necks of vases, and other objects, such as a boy lying on his back on a table with his feet towards the school, etc., the pupils are quickly brought to the proper stage of intelligence, after which they may be given the pleasure of drawing from the living model in ordinary sitting attitudes. Standing poses are tiring and uncalled for.

Conclusion

WHOEVER has mastered drawing under the conditions that have been described in what precedes, has come to that place in which he can think in shapes, and he is, for this reason, prepared to take up the study of the principles of design and composition with profit; which he could hardly do except he has been prepared for it by learning to think in shapes, which is incidental to learning to draw. Whether the individual has ordinary capability or is a genius, the best preparation is acquired through systematic work under systematic guidance and instruction.

It is not always those who learn the quickest who have the finest sensibilities. The untaught are only gems in the rough. The crooked and stunted tree might have had individual beauty if it had been given a little more light and air. Temperate and systematic instruction provides the mental light and air essential to the quickening and healthful growth of faculty.

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